

Earthquakes, Heavy Rains, and the 1825 Los Angeles River Avulsion

RE: Citation, Logical Consistency, and Internal Contradiction Issues in Published Historical Ecology Literature

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Executive Summary

This source-verification and logical consistency review analyzes claims regarding **earthquakes, heavy rains, and the 1825 Los Angeles River avulsion** as they appear in published historical ecology literature and subsequent regulatory documents. The analysis identifies two distinct and compounding categories of failure in the causal narrative that has become embedded in environmental review documentation for the Ballona Wetlands Restoration Project.

The 1825 Focus: The Los Angeles River avulsion in **1825** is the canonical date universally referenced in regulatory documents, environmental analyses, and restoration planning for the Ballona Wetlands. CDFW's Ballona Wetlands Project EIR states: "Prior to 1825, the Los Angeles River flowed through the Ballona watershed and into the Ballona Lagoon (Dark et al. 2011). Following a period of **several years of heavy rains and a series of earthquakes**, the Los Angeles River outlet moved to its current location near San Pedro. The migration of the Los Angeles River had a significant impact on the form and function of the historic Ballona Wetlands." This analysis examines both causal claims — heavy rains and earthquakes — and finds both are problematic, though for different reasons.

Key Findings:

1. **Earthquake claim contradicted by cited source — formally withdrawn by authors:**
The claim that "residents during this period frequently mention a series of earthquakes that rocked the Los Angeles area (Regan 1917)" is not present anywhere in the full text of Reagan (1917), which has been reviewed in its entirety (280 pages). Reagan's own narrative synthesis and all eyewitness testimony attribute the 1825 avulsion to hydraulic

flood forces; the cited source provides no support for the earthquake claim and instead describes hydraulic causation throughout. The claim is also not supported by compiled seismological catalogs. In a corrigendum dated April 20, 2026 (Dark et al. 2026), the authors formally withdrew it, stating they "could not confirm this claim upon consideration of our original notes and the Reagan (1917) listed as a source."

2. **Unacknowledged dual citation:** The heavy rains claim in Dark et al. 2011 cites two sources — "(lat 1906, Reagan 1917)" — while the earthquake claim immediately following cites only "(Regan 1917)." The asymmetry is analytically significant: the earthquake claim has a thinner citation basis than even the rain claim within the same paragraph. This asymmetry suggests the earthquake claim did not originate from independent corroboration.
3. **Climate claim not supported — three-year formulation withdrawn by authors:** The assertion of "three consecutive years of heavy rains" beginning in 1825 is not supported by Lynch's (1931) rainfall index reconstruction for the Los Angeles area, which documents near-normal to below-normal conditions in the post-1825 period — inconsistent with sustained multi-year heavy precipitation. In the April 20, 2026 corrigendum (Dark et al. 2026), the authors partially withdrew this claim, stating they "were unable to substantiate this claim," while retaining that "heavy rains specifically in 1825 associated with change of course of the Los Angeles River remains supported." This is consistent with a single intense flood event within an otherwise dry period, which aligns with the hydraulic debris dam failure mechanism documented in Crandell (1994).
4. **Internal temporal self-contradiction (new finding):** Dark et al. 2011 simultaneously asserts (a) the avulsion date is 1825, (b) heavy rains began in 1825 and lasted three consecutive years, and (c) the river shifted "after both" the rains and earthquakes. These three statements are logically irreconcilable. "After both" a three-year rain sequence starting in 1825 cannot be 1825. Dark et al.'s own causal narrative logically excludes 1825 as the avulsion date — a self-contradiction entirely independent of the Reagan 1917 verification problem.
5. **Contemporary historical accounts describe hydraulic, not seismic events:** The Crandell (1994) account, a well-sourced secondary historical synthesis drawing on 19th-century memoir literature, describes debris dam failure and hydraulic forces as the sole cause of the 1825 avulsion; no earthquakes are mentioned anywhere in that account. Crandell further documents a mechanistically linked 1815–1825 two-event causal chain — debris dam formation followed by catastrophic failure — that is entirely absent from Dark et al. 2011 and CDFW's EIR.
6. **Citation drift carries both failures into regulatory documents:** CDFW's EIR independently anchors the causal sequence to 1825, drops all hedging language from the source, and adds a project justification sentence not present in Dark et al. 2011. In

doing so, CDFW made independent authorial choices that compounded rather than resolved the underlying problems. The hedged historical narrative ("residents mention") has become definitive causal fact ("following a period of several years of heavy rains and a series of earthquakes"), and the temporal self-contradiction has been inherited unresolved.

This analysis is provided to assist agencies and stakeholders in evaluating the reliability of certain technical claims in published historical ecology literature and regulatory documents concerning the 1825 Los Angeles River avulsion.

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I. Background

The Passage in Question

Dark et al. 2011 (SCCWRP Technical Report #671), "Historical Ecology of the Ballona Creek Watershed," contains the following passage in the **"Watershed Background"** section (p. 4):

"Understanding the unique history of this watershed is important as it helps to identify the most appropriate target time period for this project. Prior to 1825, the Los Angeles River flowed through the Ballona watershed and into the Ballona Lagoon. However, beginning in 1825, the Los Angeles region experienced three consecutive years of heavy rains that inundated the lowland (lat 1906, Reagan 1917). Along with years of unusually high precipitation, the residents during this period frequently mention a series of earthquakes that rocked the Los Angeles area (Regan 1917). While it may not be possible to fully determine the extent of each natural change, it was after both of these that the discharge of the Los Angeles River shifted south to San Pedro."

This passage is the origin point for claims about earthquakes and heavy rains that have propagated into CDFW's regulatory documentation for the Ballona Wetlands Restoration Project.

Note on Spelling Inconsistency

The correct spelling is "Reagan" (James W. Reagan, Chief Engineer, Los Angeles County Flood Control District, 1915–1927). Dark et al. 2011 uses both spellings inconsistently within the same passage:

- **Heavy rains citation:** "(lat 1906, **Reagan** 1917)" — correct spelling
- **Earthquake citation:** "(**Regan** 1917)" — misspelling [sic]

The full bibliography entry reads:

Reagan, J.W. 1917. Los Angeles County Flood Control District (filed w/Board of Supervisors 1/2/1917), Citizen Print Shop, Los Angeles, CA. Courtesy of Huntington Library Rare Book Collection.

This spelling inconsistency indicates an editorial oversight in Dark et al. 2011. Throughout this analysis, the correct spelling "Reagan" is used when referring to the actual person or source,

except when directly quoting Dark et al.'s text, in which case the spelling error is preserved and noted with [sic].

Verification Note: This analysis conducted searches using both spellings (Reagan/Regan) to ensure comprehensive coverage of available sources.

The Dual Citation Problem

A close reading of the passage reveals an analytically significant asymmetry in citation structure:

- **Heavy rains claim:** "(lat 1906, Reagan 1917)" — **two sources cited**
- **Earthquake claim:** "(Regan 1917)" — **one source cited**

The heavy rains claim draws on both a 1906 Los Angeles Times article and Reagan 1917. The earthquake claim immediately following relies solely on Reagan 1917 — the same source that cannot be verified as containing any such claim. The earthquake assertion thus has a thinner evidentiary basis than even the rain claim within the same paragraph. This asymmetry suggests the earthquake claim did not originate from independent corroboration; a claim supported by only one source — a source whose full text has now been reviewed and found not to contain that claim — has no remaining evidentiary foundation.

Furthermore, "lat 1906" is identified in Dark et al.'s bibliography as:

Los Angeles Times (lat). 1906. "Tragedy Dam in Hot Flight" [sic — corrected to "Hot Fight" in Dark et al. 2026]. Pg II-1.

[Dark et al. 2011 bibliography entry reproduced as quoted. This is Dark et al.'s citation for the heavy rains claim only — not the earthquake claim. No independent digital access path for this 1906 Los Angeles Times article has been identified as of February 2026; it has not been independently verified in this analysis. Access may be available through ProQuest Historical Newspapers or physical archive holdings. Note: Dark et al. 2026 supplies corrected full bibliographic details for this entry: "Los Angeles Times (LAT). 1906. 'Tragedy Dam in Hot Fight.' Part II, p. 1, January 24, 1906." Until independently retrieved and reviewed, this citation must be treated as **unverified and non-operational** in evidentiary analysis — it cannot be relied upon to support or refute the heavy rains claim.]

This citation pertains to the heavy rains claim only — not the earthquake claim. Because it has not been independently retrieved or analyzed, it contributes no independent evidentiary weight to the causal narrative in this analysis. Any regulatory reliance on Dark et al.'s heavy rains claim that depends on "lat 1906" as a supporting source rests on an unverified citation.

Why This Matters

These passages have become embedded in the regulatory framework for the Ballona Wetlands Restoration Project. CDFW's EIR cites Dark et al. 2011 for the claim that heavy rains and earthquakes caused the 1825 avulsion, and adds independent authorial choices that further compound the problems. When technical assertions in certified environmental documents cannot be traced to authoritative sources — or contain internal logical contradictions — it undermines the reliability of the regulatory process.

II. Verification Methodology

This analysis follows a systematic five-step verification process adapted from ITU-T/ISO standards development methodology:

Step 1: Identify Claim — Locate the specific assertion and citation format

Step 2: Locate Primary Source — Obtain and examine the cited source document

Step 3: Cross-Reference Authoritative Sources — Check against independent contemporary records

Step 4: Assess Logical Consistency — Test claims for internal contradiction

Step 5: Document Findings — Record evidence chain and contradictions

Authoritative Sources Consulted

1. **Seismological Records:** USGS/NOAA historical earthquake databases (1800–1863)
 2. **Climate Records:** Lynch, H.B. (1931), *Rainfall and Stream Run-Off in Southern California Since 1769*, Metropolitan Water District of Southern California — Appendix D, Table 9 (Rainfall Indices, 1769–1930, p. 31)
 3. **Contemporary Accounts:** Crandell (1994), drawing on Warner, Hayes, Widney, and Talbert memoir literature
 4. **Secondary Literature:** Historical compilations and analyses
 5. **Regulatory Documents:** CDFW Ballona Wetlands Project EIR (2020); CDFW FAQ (December 30, 2020)
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III. Findings

Scope Note: This analysis evaluates the verifiability and internal logical consistency of specific claims in published historical ecology literature and their regulatory derivatives. It does not assert that no undocumented seismic or hydrological events occurred in the 1825–1828 period;

it demonstrates that the specific claims cannot be verified in cited sources, are not supported by compiled authoritative records, and in at least one critical instance contain an internal self-contradiction.

Finding 1: Climate Claim Not Supported by Authoritative Records

Claim (Dark et al. 2011, Watershed Background, p. 4):

"beginning in 1825, the Los Angeles region experienced **three consecutive years of heavy rains** that inundated the lowland (lat 1906, Reagan 1917)."

Claimed Period: Three consecutive years beginning in 1825 = 1825, 1826, 1827

Authoritative Source: Lynch, H.B. (1931). *Rainfall and Stream Run-Off in Southern California Since 1769*. Metropolitan Water District of Southern California. Appendix D, Table 9, "Rainfall Indices, 1769–1930," p. 31.

Lynch reconstructed Los Angeles area rainfall indices from 1769 to 1930 using mission crop records (San Gabriel, San Fernando, San Juan Capistrano), calibrated against post-1850 gauge measurements.

Verification Result: The years following 1825 show near-normal to below-normal conditions, not "heavy rains" or "unusually high precipitation."

From Lynch (1931), Appendix D, Table 9 (provisional values — exact values should be verified by direct inspection of the printed table):

- 1825–26: Index ≈ 45 (drought — approximately 55% below normal)
- 1826–27: Index ≈ 65 (near-normal)
- 1827–28: Index ≈ 75 (slightly below normal)
- 1828–29: Index ≈ 35 (severe drought)
- Context: Part of the 1822–1832 drought period, which Lynch characterizes as "the severest of any of which we have record" (Lynch 1931:4)

None of these years approach "heavy rains" or "unusually high precipitation." This qualitative conclusion does not depend on exact integer values — even with minor variance, no index in this range approaches above-normal conditions. The 1825 flood event itself was a single extreme hydraulic event consistent with Lynch's documented large flood interrupting the drought period.

Conclusion: The "three consecutive years of heavy rains" claim is not supported by the rainfall index reconstruction reported by Lynch (1931), Appendix D, Table 9. While a single intense

1825 storm event could have triggered the avulsion, sustained multi-year "heavy rains" during 1825–1827 did not occur according to authoritative records.

Hydrological Context: A debris-impounded system can store enough water that when it fails, the resulting outburst flood exceeds what the pre-existing channel can accommodate, even during an otherwise dry period. The Crandell (1994) account describes exactly this mechanism: a debris dam (10 to 15 feet high, extending about two-thirds of a mile) that had been impounding flow for approximately 10 years, whose catastrophic failure released "an immense wall of water" and cut a new channel. Sustained multi-year heavy rains are not required to explain the 1825 avulsion.

Implication: The "years of unusually high precipitation" claim is not merely factually unsupported — multi-year sustained heavy precipitation is also not required to explain the 1825 Los Angeles River channel change, which is fully accounted for by the debris dam failure mechanism documented in contemporary historical accounts.

Corrigendum (April 20, 2026): In Dark et al. 2026, the authors partially withdrew this claim, stating: "Upon review of Reagan 1917 and other sources, we were unable to substantiate this claim, although heavy rains specifically in 1825 associated with change of course of the Los Angeles River remains supported." The withdrawal of the "three consecutive years" formulation is significant: the multi-year sustained precipitation narrative — which drove both the internal temporal self-contradiction (Finding 3) and the unsupported causal mechanism reproduced in the CDFW EIR — is no longer asserted by the original authors. The retained claim of heavy rains specifically in 1825 is consistent with the Lynch (1931) record, which is compatible with a single intense flood event occurring within an otherwise drought-period baseline.

Finding 2: Earthquake Claim Not Supported by Seismological Database

Claim (Dark et al. 2011, Watershed Background, p. 4):

"the residents during this period frequently mention **a series of earthquakes** that rocked the Los Angeles area (Regan 1917)."

Citation Status: Reagan (1917) has now been reviewed in full text (280 pages, 915,033 characters). The word "earthquake" appears exactly twice in the entire document, both times in descriptions of the 1857 Fort Tejon earthquake, entirely unrelated to 1825 or the Los Angeles River avulsion. The phrase "three consecutive years of heavy rains" does not appear. Reagan's own narrative synthesis and all eyewitness testimony in the document attribute the 1825 channel change to hydraulic flood forces. The earthquake claim attributed by Dark et al. 2011 to "(Regan 1917)" is not present in that document; the cited source provides no support for the

claim and instead describes hydraulic causation throughout — it is inconsistent with the earthquake assertion.

Authoritative Sources: USGS Historical Earthquake Database; NOAA National Centers for Environmental Information; Toppozada et al. (2002) and other California seismicity compilations.

Verification Result: Compiled USGS/NOAA historical seismic catalogs document **one** earthquake for the Los Angeles area during the relevant period:

September 24, 1827 — Magnitude estimated ~5.5, felt in Los Angeles area

No other earthquakes appear in compiled catalogs for 1825, 1826, 1827 (other than the September event), or 1828.

Conclusion: As documented in Citation Status above, Reagan (1917) does not contain the earthquake claim; the source provides no support for it and instead describes hydraulic causation through the testimony of seven named eyewitnesses and Reagan's own narrative synthesis. The claim is additionally not supported by compiled seismological catalogs: catalogs document one event in the queried period, not a series.

Methodological Note: Even if Reagan 1917 were found to contain references to earthquake activity, such references would constitute historical anecdote — not validated geophysical evidence. Standard practice in technical documentation requires reconciliation of narrative accounts with compiled seismological catalogs before historical earthquake claims are used as causal mechanisms in regulatory documents. Reagan (1917) does not contain such references; the document's 275+ eyewitness accounts and Reagan's own narrative synthesis consistently describe the 1825 event in hydraulic terms only.

Note on catalog completeness: USGS/NOAA historical catalogs are known to be incomplete for small, local events prior to instrumental recording. This analysis does not assert that no undocumented ground motion occurred. It demonstrates that the "series of earthquakes" claim — as a documented, verifiable geophysical event — is not supported by the available compiled record.

Corrigendum (April 20, 2026): In Dark et al. 2026, the authors formally withdrew the earthquake claim, stating: "We make a claim of a 'series of earthquakes' before 1825. Upon review, we could not confirm this claim upon consideration of our original notes and the Reagan (1917) listed as a source and withdraw it." This formal withdrawal by the original authors independently confirms the central finding of this analysis. The corrigendum also corrects the Reagan/Regan spelling inconsistency documented in this report, confirming the correct spelling as "Reagan" throughout.

Finding 3: Internal Temporal Self-Contradiction in Dark et al. 2011

This finding is derived entirely from the internal logic of Dark et al.'s own text, independent of any external source.

The "Watershed Background" passage in Dark et al. 2011 contains three statements that cannot simultaneously be true:

Statement A: The avulsion date is **1825**. This is stated twice: "Prior to 1825, the Los Angeles River flowed through the Ballona watershed" and confirmed in Dark et al.'s Introduction: "just after the natural realignment of the Los Angeles River **in 1825**."

Statement B: "beginning in **1825**, the Los Angeles region experienced **three consecutive years** of heavy rains." The rain sequence begins in 1825 and runs through 1827 at minimum.

Statement C: "it was **after both of these** that the discharge of the Los Angeles River shifted south." The avulsion occurred after both the multi-year rain sequence and the concurrent earthquake period.

The logical problem: If the rains began in 1825 and lasted three consecutive years, and the avulsion occurred *after both* the rains and the earthquakes, then the avulsion cannot have occurred in 1825. "After both" a three-year sequence beginning in 1825 cannot be earlier than 1828 at the absolute minimum.

Yet Dark et al. 2011 simultaneously asserts the avulsion date is 1825 — stated twice in their own text.

Dark et al.'s own causal narrative is internally self-contradictory. The authors assert 1825 as the avulsion year while constructing a causal sequence that logically excludes 1825 as a possible outcome date. This contradiction would exist even if every factual claim in the paragraph were verified.

Summary Table:

Claim	Source	Logically Compatible with 1825 Avulsion?
Avulsion date is 1825	Dark et al. 2011, stated twice	— (this is the claim being tested)
Rains began 1825, lasted 3 years	Dark et al. 2011	No — 3-year sequence ends 1827–28 minimum

Claim	Source	Logically Compatible with 1825 Avulsion?
Avulsion occurred "after both"	Dark et al. 2011	No — "after both" excludes 1825
"Series of earthquakes" in period	Dark et al. 2011 (Reagan 1917)	No — compiled catalogs document one event (Sept 1827), more than two years post-avulsion

Finding 4: Citation Ambiguity in Original Report

The parenthetical citation "(Regan 1917)" at the end of the earthquake sentence is ambiguous. It could mean a direct quotation from Reagan, or the authors' synthesis citing Reagan as one of several sources. Technical documents should clearly distinguish direct quotations, paraphrased specific content, and synthesis from multiple sources. The Dark et al. format does not clarify whether Reagan 1917 actually contains this language or whether the authors synthesized multiple sources and chose Reagan as a representative citation.

Note: Even if this is authors' synthesis rather than direct quotation, the factual claims remain unsupported by authoritative records, and the internal temporal contradiction identified in Finding 3 remains unresolved.

Finding 5: Contemporary Historical Account Describes Hydraulic, Not Seismic Events

A well-sourced secondary historical account provides consistent historical evidence that the April 1825 river channel change was caused by hydraulic forces, not earthquakes.

Verified Source: Crandell, John. 1994. "The L.A. River's 'Natural' History." *Los Angeles Times*, August 14, 1994.

Source Characterization: Crandell explicitly bases his narrative on "Memoirs and histories by John Warner, Benhamin [sic] Hayes, Joseph Widney and Thomas Talbert." Jose Lugo (age 12 in April 1825) is a named figure in Crandell's historical reconstruction — not a directly quoted primary document. This analysis does not independently audit the original memoir texts; it evaluates the historical literature corpus as represented in Crandell (1994).

Crandell's Historical Narrative — Jose Lugo (age 12, April 1825):

"At midnight an immense wall of water poured through the narrows under the moonlight and broke through the 10-year-old debris dam. The resultant ground shaking and noise awoke the area. Jose Lugo, 12, emerged from his father's adobe on San Pedro Road, ran to the west bank of the now-empty river channel and watched the flood cutting a new channel along the far eastern side of the valley at the edge of the present Boyle Heights. The water cut away the base of the slope that defines the heights, and the morning revealed a sparkling white bluff of quartz sand and rounded white beach pebbles. It was known afterward as Paredon Blanco."

Key Points:

1. "Resultant ground shaking" describes shaking consequent to the flood event — consistent with hydraulic force rather than tectonic activity, and inconsistent with the earthquake narrative.
2. No earthquake indicators are described: no aftershocks, no extended duration, no regional effects beyond the immediate flood zone.
3. **Crandell's entire article — drawn from Warner, Hayes, Widney, and Talbert — mentions no earthquakes whatsoever.** The word "earthquake" appears only once, in an introductory geological deep-time context entirely unrelated to 1825.
4. The "residents frequently mention a series of earthquakes" claim finds no corroboration in the historical memoir corpus as synthesized by Crandell (1994).
5. Crandell explicitly calculates a 30+ hour time lag attributing the flood to a distant storm, not local seismic activity.
6. Crandell dates the flood to **April 1825**, consistent with the canonical avulsion year — but attributed entirely to hydraulic forces.

The 1815–1825 Causal Chain (Additional Finding from Crandell 1994):

Crandell's account describes two mechanistically linked events, not one. Approximately a decade before 1825, a 10-day deluge sent the Los Angeles River carrying an immense quantity of fallen trees through the Elysian Narrows. The interlocked debris formed a berm 10 to 15 feet high extending about two-thirds of a mile, deflecting the river southwestward into the Ballona Creek drainage. Crandell writes: "The river immediately shifted toward the southwest...then west into the forests and marshes of the Ballona Creek drainage." Then in April 1825, that 10-year-old debris dam failed catastrophically. The resulting flood cut a new channel eastward to what is now Boyle Heights, formed a large inland lake in what is now the Carson area, and permanently rerouted the river to San Pedro Bay.

This two-event causal chain — debris dam formation (~1815) followed by catastrophic dam failure (April 1825) — is entirely absent from the earthquake-and-rain narrative in Dark et al.

2011 and CDFW's EIR. The 1815 and 1825 events are not independent occurrences; they are a single hydraulic sequence.

Evidentiary Scope Note — Pre-1825 Accounts in Reagan (1917):

Reagan (1917) compiles testimony from interviews conducted in 1914–15. No living witness could have had personal first-hand memory of pre-1825 channel conditions; the youngest possible eyewitness to the pre-1825 Ballona channel would have needed to be born no later than approximately 1815. The evidence for Ballona as the pre-1825 route in Reagan (1917) rests on (1) oral tradition reported by witnesses as received knowledge from earlier generations, and (2) Warner's documentary synthesis based on Spanish-era records. Seven named witnesses independently confirm this oral tradition. This is substantial corroborating evidence, but it is oral tradition and secondary documentary synthesis, not first-hand eyewitness observation of the pre-1825 channel — a distinction relevant to its appropriate evidentiary weight.

Finding 6: Citation Drift and Independent Authorial Choices in Regulatory Documents

The Source Document

Dark et al. 2011 "Watershed Background" passage (p. 4) contains the following language:

"Along with years of unusually high precipitation, the residents during this period **frequently mention** a series of earthquakes that rocked the Los Angeles area (Regan 1917). **While it may not be possible to fully determine the extent of each natural change**, it was **after both of these** that the discharge of the Los Angeles River shifted south to San Pedro."

The passage is characterized throughout by hedging ("frequently mention," "may not be possible to fully determine"), leaves the avulsion outcome unanchored to a specific date in the causal sentence, and — as documented in Finding 3 — contains an internal temporal self-contradiction.

CDFW EIR: Independent Authorial Choices

The California Department of Fish and Wildlife Ballona Wetlands Project EIR (2020) contains the following passage, citing Dark et al. 2011:

"Prior to 1825, the Los Angeles River flowed through the Ballona watershed and into the Ballona Lagoon (Dark et al. 2011). Following a period of several years of

heavy rains and a series of earthquakes, the Los Angeles River outlet moved to its current location near San Pedro. The migration of the Los Angeles River had a significant impact on the form and function of the historic Ballona Wetlands."

This passage represents more than passive inheritance of Dark et al.'s language. CDFW made independent authorial choices that compounded rather than resolved the underlying problems:

Choice 1 — Explicit 1825 anchoring: Dark et al.'s causal sentence does not anchor the avulsion to a specific year — it says only "it was after both of these that the discharge...shifted." CDFW explicitly opens the passage with "Prior to **1825**" and then immediately follows with the causal sequence, creating an explicit and unambiguous link between 1825 and the heavy rains/earthquake narrative. This makes the temporal self-contradiction — present but somewhat obscured in Dark et al. — an explicit feature of CDFW's own text.

Choice 2 — All hedging language removed: Dark et al.'s "residents during this period frequently mention" and "it may not be possible to fully determine" signal that the authors were reporting oral tradition under acknowledged uncertainty. CDFW's "Following a period of several years of heavy rains and a series of earthquakes" presents both claims as established historical fact, with no attribution to residents, no uncertainty qualifier, and no acknowledgment that the underlying source is unverified.

Choice 3 — Project justification sentence added: Dark et al.'s passage ends with the river shifting "south to San Pedro" — a historical observation. CDFW adds a third sentence not present in Dark et al.: "The migration of the Los Angeles River had a **significant impact** on the form and function of the historic Ballona Wetlands." This sentence transforms the historical narrative into active project justification, directly connecting the unverified causal claims to the rationale for the restoration project.

Choice 4 — Temporal contradiction inherited unresolved: CDFW's "following a period of several years" language inherits Dark et al.'s "after both" logic without resolving the contradiction. The vague "several years" formulation obscures rather than addresses the fact that a multi-year causal sequence beginning in 1825 cannot conclude in 1825.

Second confirmed instance: The identical language appears in CDFW's public-facing FAQ document (December 30, 2020), under "What was here before BWER?":

"Prior to 1825, the Los Angeles River flowed through the Ballona watershed and into the Ballona Lagoon. Following a period of several years of heavy rains and a series of earthquakes, the Los Angeles River outlet moved to its current location near San Pedro."

The unverified and internally contradictory narrative has migrated into public communications used to characterize and justify the restoration project.

Transformation Analysis

Element	Dark et al. 2011	CDFW EIR	Change
Avulsion date anchoring	Implicit only	"Prior to 1825" — explicit	Implicit → Explicit
Earthquake attribution	"residents...mention"	Stated as fact	Oral tradition → Technical fact
Hedging language	"frequently mention," "may not be possible to determine"	None	Acknowledged uncertainty → Definitive assertion
Causal relationship	"after both of these" (temporal sequence only)	"Following a period of..." (explicit causation)	Sequence → Causation
Temporal contradiction	Present but partially obscured	Inherited and made explicit by 1825 anchoring	Obscured → Explicit
Project connection	None	"significant impact on the form and function"	Historical narrative → Project justification
Evidence standard	Historical narrative with hedging	Technical basis for environmental documentation	Narrative → Regulatory fact

Both Failures Propagate Together

CDFW's EIR inherits from Dark et al. 2011 two distinct and compounding evidentiary failures, and through its independent authorial choices, makes both more consequential:

Failure 1 — Contradicted citation: The earthquake claim rests on Reagan 1917, whose full text has now been reviewed. That document does not contain the earthquake claim; it provides no support for the claim and instead describes hydraulic causation throughout. The claim is additionally unsupported by compiled seismological catalogs. CDFW removes all hedging and presents this as fact.

Failure 2 — Internal temporal self-contradiction: Dark et al.'s "after both" logic is incompatible with a 1825 avulsion date. CDFW explicitly anchors the passage to 1825, making the contradiction more prominent rather than less.

The 1825 Problem: Temporal Analysis

What all documents assert: The avulsion occurred in **1825**.

What the causal narrative requires: The avulsion occurred after three consecutive years of heavy rains beginning in 1825, and after concurrent earthquakes — meaning after 1827 at minimum.

Timeframe	Claim	Seismological Record	Conclusion
1825 only (canonical avulsion year)	"series of earthquakes"	Compiled catalogs: no events documented	Claim not supported
1825–1827 (three-year window)	"series of earthquakes"	One earthquake (Sept 24, 1827)	"Series" not supported; single event more than two years post-avulsion

The sole earthquake in the queried period (September 1827) occurred two full years after the canonical avulsion date.

Professional Standards Comparison

Standard Requirement	Practice in Documents Under Review	Gap
Primary source verification	Reagan 1917 reviewed in full: earthquake claim not present; LAT 1906 unanalyzed	Two-level citation gap
Cross-database validation	No evidence of USGS/NOAA or Lynch (1931) cross-check	No independent validation documented
Internal logical consistency	Temporal self-contradiction present in source, inherited by regulatory document	Contradiction not identified or resolved
Uncertainty qualification	Source hedging ("residents mention") stripped in regulatory restatement	Acknowledged uncertainty → Definitive fact

Standard Requirement	Practice in Documents Under Review	Gap
Project justification standard	Unverified narrative used as basis for "significant impact" claim	Unverified claim → Regulatory justification

"Science-Based" Characterization: Both CDFW and the Friends of Ballona Wetlands describe the Ballona Wetlands Restoration Project as "science-based" (CDFW FAQ, December 30, 2020: "long-term, science-based plan"; Friends of Ballona Wetlands website: "science-based restoration"). The project's historical baseline narrative rests on claims that cannot be verified in cited sources, are not supported by authoritative seismological and climate records, contain an internal temporal self-contradiction in the source document, and were further hardened into definitive fact through independent authorial choices in CDFW's regulatory documents. Characterizing a project as "science-based" while its foundational historical claims have not been validated against available scientific records indicates a lack of demonstrated alignment between stated methodology and documented evidentiary practice.

IV. Why These Failures Matter

Cascade Effect in Regulatory Process

Technical reports become source material for Environmental Impact Reports, Coastal Development Permits, Army Corps of Engineers assessments, and State and federal regulatory decisions. When source documents contain unverified claims or internal contradictions, these errors propagate through subsequent analyses. Each citation layer adds apparent credibility while the foundational problems remain unresolved. In this case, the regulatory document did not merely inherit errors passively — it made independent choices that amplified them.

Observed Pattern of Validation Gaps

This analysis highlights potential weaknesses in source-validation procedures at multiple levels of the review process:

1. **No primary source verification:** Claims were not verified against the cited source (Reagan 1917)
2. **No cross-reference checking:** Claims were not compared with authoritative databases (USGS seismological records, Lynch 1931 climate reconstruction)
3. **No internal consistency check:** The temporal self-contradiction within the source passage was not identified at either the publication or regulatory review stage

4. **Ambiguous citation format:** The source document does not distinguish direct quotes from synthesis
5. **Hedging removal without verification:** Regulatory restatement stripped uncertainty qualifiers without verifying the underlying claims
6. **No correction mechanism:** Once published and cited, flawed claims persist and propagate without correction

Comparison to Standards Development (ITU-T/ISO)

In telecommunications and technology standards development (ITU-T, ISO, IEEE), technical assertions must be answerable from authoritative sources before a standard is approved, and must be internally consistent. The following comparison is a **normative benchmark** against the **descriptive observation** that no comparable validation appears in the documents under review.

ITU-T "Question" Framework applied:

- **Question:** "What is the factual basis for the earthquake and precipitation claims cited in support of the 1825 avulsion narrative?"
- **Answer Requirements:**
 - ☐ Direct quotation from Reagan 1917 with page number → **NOT PRESENT (full text verified)**
 - ☐ Corroboration from independent contemporary sources → **NONE IDENTIFIED**
 - ☐ Consistency with Lynch (1931) climate records → **FAILS**
 - ☐ Consistency with seismological databases → **FAILS**
 - ☐ Internal logical consistency → **FAILS**
- **Result:** **CANNOT BE ANSWERED** from authoritative sources → claims should not be incorporated into technical specifications without resolution

Need for Primary Source Standards

Regulatory agencies should require that all technical assertions used as causal mechanisms be traceable to authoritative sources with explicit documentation of verification methodology. This includes direct source verification with page numbers, cross-reference validation against independent authoritative databases, internal consistency review, explicit citation format distinguishing quotes from synthesis, and verification methodology documentation before documents enter the regulatory process.

V. Implications for Ballona Wetlands Project

The Ballona Wetlands Restoration Project environmental review process has relied on historical ecology literature for its foundational narrative about why the 1825 avulsion occurred and what conditions prevailed in the watershed. When that foundational narrative contains unverified citations, unsupported empirical claims, and an internal temporal self-contradiction — and when the regulatory document compounds these problems through independent authorial choices — it raises questions about the thoroughness of technical review throughout the project.

Specific Concerns:

1. **The 1825 canonical date itself:** Dark et al.'s own causal narrative logically excludes 1825 as the avulsion year. CDFW's EIR explicitly anchors the narrative to 1825 while inheriting the incompatible causal logic. The avulsion date, while widely cited as 1825 in regional historiography and engineering literature, is not independently established within the causal framework presented in either document — the internal logic of that framework points to a date no earlier than 1828.
 2. **Compound errors across documents:** The unverified earthquake claim and the temporal self-contradiction have propagated together through the citation chain into certified regulatory documents, with each successive document making the claims more definitive rather than more qualified.
 3. **Project justification:** CDFW's added sentence — "The migration of the Los Angeles River had a significant impact on the form and function of the historic Ballona Wetlands" — directly connects unverified and internally contradictory claims to the rationale for the restoration project.
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VI. Suggested Actions

For Technical Report Authors

Note: A corrigendum to Dark et al. 2011 was issued April 20, 2026 (Dark et al. 2026), formally withdrawing the earthquake claim and partially withdrawing the three-year heavy rains claim. The actions below are retained for the historical record of this analysis and for the benefit of any downstream documents that have cited the original passage.

1. **Review the Watershed Background passage** in Dark et al. 2011 for accuracy of the earthquake and precipitation claims, and for the internal temporal consistency issue

identified in Finding 3. *[Addressed in Dark et al. 2026: earthquake claim withdrawn; three-year rain formulation withdrawn; 1825 heavy rains retained.]*

2. **Clarify citation intent for the earthquake claim:** Determine whether "(Regan 1917)" represents a direct quotation, a paraphrase of specific content, or a synthesis — and provide page references accordingly. *[Addressed in Dark et al. 2026: claim withdrawn.]*
3. **Clarify the temporal sequence:** The passage simultaneously asserts 1825 as the avulsion year and constructs a causal sequence that logically excludes 1825. Clarification of the intended temporal logic would strengthen the document. *[Partially addressed: withdrawal of the three-year rain formulation removes the primary driver of the temporal contradiction, though the "after both" language remains in the original text.]*
4. **Cross-reference authoritative records:** Verify claims against Lynch (1931) rainfall index reconstruction and USGS/NOAA seismological databases.
5. **Consider issuing corrigendum** if claims cannot be verified or the internal contradiction cannot be resolved. *[Completed: Dark et al. 2026, April 20, 2026.]*

The author acknowledges with appreciation that the report's authors independently reviewed their original notes, confirmed the findings documented here, and issued a formal corrigendum. The corrigendum states that its corrections "are to be considered an updated and superseding version of the original report."

For Regulatory Agencies

1. **Note the dual failure** documented here — unverified citation and internal temporal self-contradiction — when relying on historical ecology literature for the 1825 avulsion causal narrative.
2. **Review the independent authorial choices** in the CDFW EIR passage, specifically the explicit 1825 anchoring, removal of uncertainty qualifiers, and addition of the project justification sentence, in light of the underlying evidentiary problems documented here.
3. **Consider independent verification** of the 1825 avulsion date and its proposed causal mechanisms against primary historical and geophysical sources.
4. **Consider primary source verification requirements** for technical claims used as causal mechanisms in certified environmental documents.
5. **Consider correction mechanisms** for errors identified in certified environmental documents when contradictions with authoritative sources are identified.

VII. Conclusion

This analysis documents two distinct and compounding failures in the causal narrative used to explain the 1825 Los Angeles River avulsion — failures that originate in published historical ecology literature and are carried forward, and in some respects amplified, in CDFW's regulatory documentation.

The first failure is evidentiary: the earthquake claim cites a source (Reagan 1917) whose full text has been reviewed and found not to contain that claim — a source whose content actively contradicts it. The claim is additionally not supported by compiled seismological catalogs. As documented in Finding 2, the cited source has no remaining evidentiary foundation for the earthquake assertion.

The second failure is logical: Dark et al. 2011's own "Watershed Background" passage simultaneously asserts that the avulsion occurred in 1825 and constructs a causal sequence — three consecutive years of heavy rains and concurrent earthquakes, after both of which the river shifted — that logically cannot conclude in 1825. This internal temporal self-contradiction exists entirely within Dark et al.'s own text.

CDFW's EIR did not resolve either failure. Instead, its independent authorial choices — explicitly anchoring the passage to 1825, removing all hedging language, and adding a project justification sentence — made both failures more consequential. The hedged historical narrative ("residents mention") became definitive causal fact ("following a period of several years of heavy rains and a series of earthquakes"), and the temporal contradiction became an explicit feature of certified regulatory documentation.

Corrigendum Resolution (April 20, 2026): Following independent review of the findings documented in this analysis, the authors of Dark et al. 2011 issued a formal corrigendum (Dark et al. 2026) that directly addresses both primary failures. The earthquake claim was formally withdrawn: the authors "could not confirm this claim upon consideration of our original notes and the Reagan (1917) listed as a source and withdraw it." The three-year heavy rains formulation was partially withdrawn: the authors "were unable to substantiate this claim," retaining only that heavy rains specifically in 1825 remain supported. The corrigendum states that its corrections "are to be considered an updated and superseding version of the original report." The corrigendum acknowledges Tom McMahon for careful review of the report.

The formal withdrawal of the earthquake claim and the three-year precipitation formulation by the original authors resolves the primary evidentiary failures documented here. What remains unresolved — and which CDFW must now address in the rEIR — is that its own certified EIR language reproduces both the earthquake claim and the multi-year precipitation narrative in stronger, unhedged form. The corrigendum supersedes the original report; it does not reach

forward to correct derivative regulatory documents. That correction requires independent action by CDFW.

Scope Note: This analysis does not assert that no undocumented seismic or hydrological events contributed to the 1825 avulsion. It demonstrates that the specific claims as stated are not supported by verifiable sources, are contradicted by available authoritative records, and contain an internal self-contradiction that calls the entire causal narrative into question — conclusions now confirmed by the original authors' corrigendum.

The path forward is systematic: implement primary source verification, require cross-database validation, establish internal consistency review as a standard step in technical peer review, and create correction mechanisms when errors are identified after publication. The issuance of Dark et al. 2026 demonstrates that such mechanisms can work when primary source review is conducted with rigor.

References

Hyperlink verification note: All hyperlinks verified live as of February 2026; all hyperlinks independently re-verified April 21, 2026 by Perplexity AI live URL check. Targets and availability may change without notice.

Primary Authoritative Sources:

Lynch, H.B. 1931. *Rainfall and Stream Run-Off in Southern California Since 1769*. Metropolitan Water District of Southern California. Los Angeles, California. August 1931. Foreword by F.E. Weymouth, Chief Engineer. [Appendix D, Table 9: "Rainfall Indices, 1769–1930," p. 31.]
Authoritative copy (Huntington Library):

<https://www.huntington.org/collections/lib-mssclover-aspace-4c573ee6b60cfdfe00cb6ebcff3a4490> Mirror (CEPSYM): https://cepsym.org/history/RainfallStreamRunoffSoCA_since1769.pdf
Mirror (CSUMB Digital Commons): https://digitalcommons.csumb.edu/hornbeck_usa_3_d/55/

McGlashan, H.D., and F.C. Ebert. 1918. "Southern California Floods of January 1916." *U.S. Geological Survey Water Supply Paper 426*. Washington, DC: Government Printing Office.
[Contains qualitative flood chronology only; does NOT contain Mission San Gabriel precipitation data for the 1820s. Not a valid source for pre-1850 rainfall reconstruction.]
<https://pubs.usgs.gov/wsp/0426/report.pdf>

Topozada, Tousson R., David M. Branum, Mark S. Reichle, and Charles L. Hallstrom. 2002. "San Andreas Fault Zone, California: M≥5.5 Earthquake History." *Bulletin of the Seismological Society of America* 92(7): 2555–2601. <https://doi.org/10.1785/0120000614> Alternative access:

<https://pubs.usgs.gov/publication/70024232> Alternative access:
<https://www.researchgate.net/publication/253512379>

USGS Historical Earthquake Database. Accessed via USGS Earthquake Hazards Program:
<https://earthquake.usgs.gov/>

NOAA National Centers for Environmental Information (NCEI). Historical Earthquake Database.
<https://www.ngdc.noaa.gov/hazard/earthqk.shtml> Alternative modern portal:
<https://www.ngdc.noaa.gov/hazel/view/hazards/earthquake/search>

Crandell, John. 1994. "The L.A. River's 'Natural' History: Until 1825, the Los Angeles Basin was vastly different from the current desert." *Los Angeles Times*, August 14, 1994. Publisher archive:
<https://www.latimes.com/archives/la-xpm-1994-08-14-me-27083-story.html> Wayback capture index:
https://web.archive.org/web/*/https://www.latimes.com/archives/la-xpm-1994-08-14-me-27083-story.html

McMahon, Tom. 2023. "CDFW REIR Scoping Comments, Earthquakes." Internet Archive.
<https://archive.org/details/cdfw-reir-scoping-comments-earthquakes-tom-mc-mahon-2023-11-20-02>

Regulatory and Advocacy Documents Containing Claims Under Review:

California Department of Fish and Wildlife (CDFW). 2020. Ballona Wetlands Restoration Project Environmental Impact Report. [Contains three-sentence passage citing Dark et al. 2011 for heavy rains and earthquake claims; adds project justification sentence not present in source document.] <https://wildlife.ca.gov/Regions/5/Ballona-EIR>

California Department of Fish and Wildlife (CDFW). 2020. "Ballona Wetlands Restoration Project FAQs." December 30, 2020. [Reproduces heavy rains and earthquake language verbatim under "What was here before BWER?"; describes project as "long-term, science-based plan."] <https://wildlife.ca.gov/Regions/5/Ballona-EIR>

Friends of Ballona Wetlands. n.d. "Restoring Ballona." [Describes project as "science-based restoration."] <https://www.ballonafriends.org/restoring-ballona>

Cited Document Under Review:

Dark, Shawna, Eric D. Stein, Danielle Bram, Joel Osuna, Joseph Monteferrante, Travis Longcore, Robin Grossinger, and Erin Beller. 2011. "Historical Ecology of the Ballona Creek Watershed." *Southern California Coastal Water Research Project Technical Report #671*. Costa Mesa, CA: SCCWRP.

https://ftp.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/671_BallonaHistoricalEcology.pdf

Dark, Shawna, Eric D. Stein, Danielle Bram, Joel Osuna, Joseph Monteferrante, Travis Longcore, Robin Grossinger, and Erin Beller. 2026. "Corrigenda: Historical Ecology of the Ballona Creek Watershed (Dark et al. 2011)." Corrections to: *Southern California Coastal Water Research Project Technical Report #671*, 2011. April 20, 2026. Urban Wildlands Group. https://www.urbanwildlands.org/Resources/TR_671_Ballona%20Historical%20Ecology.pdf

[Opening statement: "The authors acknowledge Tom McMahon for careful review of the report and share the following corrigenda, such corrections to be considered an updated and superseding version of the original report."] [Key corrections relevant to this analysis: (1) Earthquake claim formally withdrawn — "We make a claim of a 'series of earthquakes' before 1825. Upon review, we could not confirm this claim upon consideration of our original notes and the Reagan (1917) listed as a source and withdraw it." (2) Three-year heavy rains formulation partially withdrawn — "Upon review of Reagan 1917 and other sources, we were unable to substantiate this claim, although heavy rains specifically in 1825 associated with change of course of the Los Angeles River remains supported." (3) Reagan/Regan spelling corrected throughout. Additional corrections: missing Manies 1997 citation supplied; Grossinger 2005 corrected to Grossinger and Askevold 2005; Reagan 1915 on p. 23 corrected to Reagan 1917; Hansen and Jackson 1889 bibliography entry supplied; Figure 22 caption year corrected; NRC 2001 and Gumprecht 1999 bibliography corrections; full LAT 1887, LAT 1906, and LAT 1914 bibliographic details supplied.]

Reagan, J.W. 1917. *Early Floods in Los Angeles County*. Los Angeles County Flood Control District (filed w/Board of Supervisors 1/2/1917). Citizen Print Shop, Los Angeles, CA. [Full text reviewed February 2026. 280 pages, eyewitness interview compilation and narrative synthesis. Contains no earthquake claim connected to 1825; provides no support for such a claim and instead describes hydraulic causation throughout. Authoritative copy: Huntington Library Rare Book Collection, San Marino, CA. Cited in Dark et al. 2011 bibliography as "Reagan, J.W. 1917" but spelled "Regan 1917" in the earthquake in-text citation (sic); spelled correctly as "Reagan 1917" in the heavy rains in-text citation in the same paragraph. Spelling corrected to "Reagan" throughout in Dark et al. 2026.]

Alternative mirror site for Dark et al. 2011 (non-authoritative; content unverified against SCCWRP master copy):

- https://www.ballonahe.org/downloads/non_geo_data/ballona_report%5Bemail%5D.pdf

Note: The Urban Wildlands Group URL

(https://www.urbanwildlands.org/Resources/TR_671_Ballona%20Historical%20Ecology.pdf) previously listed as a mirror of Dark et al. 2011 now hosts the April 20, 2026 corrigendum (Dark et al. 2026), which supersedes the original report per the corrigendum's own terms. The SCCWRP FTP URL above remains the authoritative citation for the 2011 report itself.

Appendix A: Research Methodology

A.1 Source Access and Limitations

Reagan 1917 — Full Text Verified:

- Title: *Early Floods in Los Angeles County*
- Location: Huntington Library, San Marino, CA (Rare Book Collection); digitized OCR text reviewed February 2026
- Status: Full text reviewed — 280 pages, 915,033 characters, 275+ named eyewitness interview transcripts plus Reagan's narrative synthesis
- Key findings on direct inspection: (1) The word "earthquake" appears exactly twice in the entire document — p. 249 (Thurman account, 1857 Fort Tejon earthquake) and p. 253 (Guess account, 1857 Fort Tejon earthquake) — no earthquake reference connected to 1825 exists anywhere in the document. (2) The phrase "three consecutive years of heavy rains" does not appear. (3) Reagan's own narrative synthesis (pp. 239–240, Guinn/Warner section) and all eyewitness testimony attribute the 1825 avulsion to hydraulic flood forces, drawing primarily on Col. J.J. Warner's historical accounts (Warner 1825 quotation in early compilation: p. 12). (4) Seven named eyewitnesses independently confirm Ballona as the pre-1825 route through oral tradition and received knowledge: Sepulveda (p. 19), Tononi (p. 72), Ramirez (p. 80), Vejar (p. 108), and others.
- Implication: The earthquake claim attributed by Dark et al. 2011 to "(Regan 1917)" is not present in the cited source. The cited source provides no support for the claim and instead describes hydraulic causation throughout.

Digital Archives Accessed:

- USGS Publications Warehouse; USGS Historical Earthquake Database; NOAA/NCEI Historical Earthquake Database; HathiTrust Digital Library; Internet Archive; Los Angeles Times Historical Archive; California Digital Newspaper Collection (CDNC); Calisphere; Online Archive of California (OAC); Library of Congress

A.2 Search Methodology

Seismological Database Queries: Southern California earthquakes, 1800–1863; Los Angeles County and adjacent areas; all documented magnitudes. Result: one earthquake in the 1825–1828 period (September 24, 1827, ~M5.5).

Climate Record Verification: Primary source: Lynch (1931), Appendix D, Table 9, p. 31. Provisional indices ≈45, ≈65, ≈75, ≈35 for 1825–29. Qualitative conclusion does not depend on exact values. No year in this range approaches above-normal conditions.

Logical Consistency Review: Direct textual analysis of Dark et al. 2011 "Watershed Background" passage. Finding derived entirely from internal logic of the passage — no external source required. Three mutually contradictory statements identified: (1) avulsion date 1825, (2) causal sequence begins 1825 spanning three years, (3) avulsion occurred "after both."

Contemporary Account Verification: Crandell (1994), *Los Angeles Times*, August 14, 1994. Tier 2A verified secondary historical account drawing on Warner, Hayes, Widney, and Talbert memoir literature. Entire article mentions no earthquakes; describes hydraulic causation only; describes 1815–1825 debris dam causal chain.

Reagan 1917 Full Text Review: Complete text reviewed February 2026 (280 pages, 915,033 characters). Systematic search for "earthquake," "quake," "seismic," "tremor," and related terms confirmed: two instances only — p. 249 (Thurman account, 1857 Fort Tejon earthquake) and p. 253 (Guess account, 1857 Fort Tejon earthquake) — both entirely unrelated to 1825. Full-text search for "three consecutive," "heavy rain," "years of rain," and "unusually high precipitation" returned zero results for those exact phrases. Reagan's 1825 narrative synthesis located at pp. 239–240 (Guinn/Warner section); Warner 1825 quotation in early compilation at p. 12. Key 1825 witnesses with page locations: Sepulveda (p. 19), Tononi (p. 72), Ramirez (p. 80), Vejar (p. 108). Seven named eyewitnesses confirmed Ballona as pre-1825 route through oral tradition. Reagan's narrative synthesis attributes 1825 avulsion to hydraulic forces, quoting Warner extensively.

Keywords for discoverability: Ballona Creek, SCCWRP Report 671, 1825 Los Angeles River, Regan 1917, Reagan 1917, Dark et al. 2011, Dark et al. 2026, corrigendum, Lynch 1931, rainfall index, CDFW EIR, ITU-T Question, Ballona Wetlands Restoration Project, California Department of Fish and Wildlife, CDFW, T-Sheet No. 1432b, Friends of Ballona Wetlands, REIR Scoping Comments, Playa del Rey, Marina del Rey, Centinela Creek, Del Rey Lagoon, NOAA, LA River, Historical Ecology of the Ballona Creek Watershed, Southern California Coastal Water Research Project, Los Angeles River avulsion, temporal self-contradiction, citation drift, independent authorial choices, earthquake claim withdrawn, heavy rains claim withdrawn

Version 1.13 (April 21, 2026 — One change from v1.12:

(1) HYPERLINK VERIFICATION NOTE UPDATED: References section hyperlink verification note updated from "corrigendum URL verified April 21, 2026" to "all hyperlinks independently

re-verified April 21, 2026 by Perplexity AI live URL check." Perplexity confirmed all listed URLs clickable and correctly targeted as of April 21, 2026, including the Huntington Lynch catalog entry, CEPASYM Lynch mirror, SCCWRP FTP PDF, ballonahe.org mirror, corrigendum URL, and all other references. This completes the triple-AI peer review cycle for v1.12/v1.13.)

Version 1.12 (April 21, 2026 — Five changes from v1.11, implementing ChatGPT final audit recommendations:

(1) "HYDROLOGICALLY UNNECESSARY" REPLACED: Finding 1 Implication paragraph revised from "hydrologically unnecessary to explain" to "not required to explain." Consistent with phrasing used elsewhere in the document; removes rhetorical vulnerability without changing the substantive argument.

(2) "ACTIVELY CONTRADICTS" REDUCED TO ONE INSTANCE: Six body instances replaced with "provides no support for the claim and instead describes hydraulic causation throughout" or equivalent precise phrasing. One instance retained in Conclusion (line 436) as the strongest summary location where the formulation is most defensible in context. Version history log entries retain original wording as historical record. This change reflects the technical nuance that Reagan (1917) does not explicitly negate earthquake claims — it simply does not contain them and describes hydraulic causation — making "actively contradicts" slightly stronger than the evidence strictly supports in most locations.

(3) 1825 DATE OVERREACH CORRECTED: Section V item 1 revised from "The avulsion date requires independent documentation separate from the causal narrative, which neither document provides" to "The avulsion date, while widely cited as 1825 in regional historiography and engineering literature, is not independently established within the causal framework presented in either document — the internal logic of that framework points to a date no earlier than 1828." The prior language was overly broad and potentially incorrect; the 1825 date is well established in the historical record. The argument is about the internal logical failure of the causal framework, not about the date itself.

(4) "SCIENCE-BASED" CRITIQUE TIGHTENED: Closing sentence of the "Science-Based Characterization" paragraph revised from "indicates a gap between stated methodology and actual practice" to "indicates a lack of demonstrated alignment between stated methodology and documented evidentiary practice." Reads as expert testimony rather than editorial comment.

(5) CRANDELL "RESULTANT GROUND SHAKING" QUALIFIER ADDED: Finding 5 Key Point 1 revised from "'Resultant ground shaking' explicitly attributes the shaking to hydraulic force — not tectonic activity" to "'Resultant ground shaking' describes shaking consequent to the flood event — consistent with hydraulic force rather than tectonic activity, and inconsistent with the earthquake narrative." Removes interpretive overreach; positions the observation as a reasoned inference rather than a direct attribution.)

Version 1.11 (April 21, 2026 — Four corrections from v1.10, identified during full-document integrity review:

(1) LAT 1906 TITLE ERROR FLAGGED: "[sic — corrected to 'Hot Fight' in Dark et al. 2026]" added inline to the verbatim Dark et al. 2011 bibliography quotation of the LAT 1906 entry, which reads "Tragedy Dam in Hot Flight." The [sic] notation alerts readers that the title is reproduced as it appears in the original, and that Dark et al. 2026 supplies the corrected title "Tragedy Dam in Hot Fight." This resolves potential reader confusion between line 105 (original misspelled title) and line 107 (corrected title from corrigendum).

(2) "TWO YEARS POST-AVULSION" CORRECTED IN FINDING 3 SUMMARY TABLE: Cell reading "two years post-avulsion" corrected to "more than two years post-avulsion." September 1827 to April 1825 is approximately 28–29 months; "more than two years" is precise and unattackable.

(3) "TWO YEARS POST-AVULSION" CORRECTED IN FINDING 6 TEMPORAL ANALYSIS TABLE: Same correction applied to parallel cell in Finding 6 temporal analysis table for consistency.

(4) PROFESSIONAL STANDARDS TABLE CORRECTED: Cell reading "Reagan 1917 unverified" corrected to "Reagan 1917 reviewed in full: earthquake claim not present." Reagan 1917 is the most thoroughly verified source in this analysis; the prior wording was a material inaccuracy carried forward from an earlier version before full-text review was completed.)

Version 1.10 (April 21, 2026 — Six changes from v1.9, all implementing ChatGPT peer review recommendations:

(1) SEISMOLOGY PHRASING STANDARDIZED: All instances of "records show one earthquake" and "only one earthquake appears" replaced with "compiled catalogs document one event" or equivalent. Four locations updated across Finding 2, Finding 3 summary table, Finding 6 transformation table, and Verification Result heading. Appendix A.2 methodology result line already correct, left unchanged. Eliminates implied catalog completeness.

(2) LAT 1906 CLASSIFIED AS UNVERIFIED AND NON-OPERATIONAL: Bracketed annotation in Section I expanded to include corrected bibliographic details from Dark et al. 2026 and explicit classification: "this citation must be treated as unverified and non-operational in evidentiary analysis." Following sentence strengthened from passive acknowledgment to active statement of evidentiary consequence: "contributes no independent evidentiary weight" and "any regulatory reliance...rests on an unverified citation."

(3) DUAL CITATION ASYMMETRY IMPLICATION ADDED: New sentence added to Section I body and Executive Summary Finding 2: "This asymmetry suggests the earthquake claim did not originate from independent corroboration." Section I body version carries the full logical

consequence: "a claim supported by only one source — a source whose full text has now been reviewed and found not to contain that claim — has no remaining evidentiary foundation."

(4) CRANDELL EVIDENTIARY LANGUAGE CALIBRATED: "A verified contemporary account provides direct evidence" (Finding 5 opening) replaced with "A well-sourced secondary historical account provides consistent historical evidence." "The verified Crandell (1994) account" (Executive Summary Finding 5) replaced with "The Crandell (1994) account, a well-sourced secondary historical synthesis." Appendix A.2 "Tier 2A verified secondary historical account" label retained — it is a methodology classification, not an evidentiary claim.

(5) EXECUTIVE SUMMARY TIGHTENED — APPROXIMATELY 20% REDUCTION: Finding 1 trimmed: Fort Tejon detail removed, core argument and withdrawal retained. Finding 3 trimmed: Lynch provisional index values removed, qualitative conclusion and corrigendum retained. Finding 5 trimmed: debris dam geographic detail removed, causal summary and absence-from-regulatory-docs retained. Findings 2, 4, and 6 unchanged.

(6) REDUNDANCY CONSOLIDATED — TWO LOCATIONS: Finding 2 Conclusion block compressed from four sentences to two; restatement of Citation Status replaced with forward reference, seismological catalog bridge retained. Conclusion first-failure paragraph compressed from three sentences to three tighter sentences; full evidentiary argument removed from Conclusion (it belongs in Finding 2) and replaced with cross-reference. All detail remains intact in primary locations.)

Version 1.9 (April 21, 2026 — Nine changes from v1.8:

(1) FRONT MATTER UPDATED: Version number updated to 1.9; document preparation date updated to "February 2026; revised April 21, 2026"; filename updated to v1.9.

(2) EXECUTIVE SUMMARY FINDING 1 UPDATED — CORRIGENDUM WITHDRAWAL: Finding 1 label updated to "Earthquake claim contradicted by cited source — formally withdrawn by authors." Sentence added documenting formal withdrawal in Dark et al. 2026, quoting the authors' withdrawal language verbatim.

(3) EXECUTIVE SUMMARY FINDING 3 UPDATED — CORRIGENDUM PARTIAL WITHDRAWAL: Finding 3 updated to document the authors' partial withdrawal of the three-year heavy rains formulation in Dark et al. 2026, with the retained claim (heavy rains in 1825 specifically) noted. Relationship to Lynch (1931) and debris dam mechanism noted.

(4) FINDING 1 BODY UPDATED — CORRIGENDUM PARAGRAPH ADDED: New "Corrigendum (April 20, 2026)" paragraph added after the Implication paragraph, quoting the authors' partial withdrawal language and analyzing its significance — specifically that the withdrawn three-year formulation was the primary driver of the temporal self-contradiction (Finding 3) and the CDFW EIR's unsupported multi-year precipitation narrative.

(5) FINDING 2 BODY UPDATED — CORRIGENDUM PARAGRAPH ADDED: New "Corrigendum (April 20, 2026)" paragraph added after the catalog completeness note, quoting the authors' formal earthquake withdrawal language verbatim and noting that the corrigendum also corrects the Reagan/Regan spelling inconsistency documented in this report.

(6) SECTION VI (SUGGESTED ACTIONS — FOR TECHNICAL REPORT AUTHORS) UPDATED: Note added that the corrigendum has been issued. Each action item annotated with corrigendum resolution status. Closing paragraph updated from an invitation to the authors to a statement acknowledging their independent review and the corrigendum's superseding terms.

(7) SECTION VII (CONCLUSION) UPDATED: New "Corrigendum Resolution (April 20, 2026)" paragraph added, summarizing both withdrawals, quoting the corrigendum's acknowledgment of Tom McMahon, and quoting the superseding-version language. Additional paragraph added noting that the corrigendum does not reach forward to correct derivative regulatory documents and that CDFW must act independently. Final sentence updated to reference Dark et al. 2026 as evidence that primary source review mechanisms can work.

(8) REFERENCES UPDATED — FOUR CHANGES: (a) Hyperlink verification note updated to include April 21, 2026 for corrigendum URL. (b) Dark et al. 2011 entry retained; Dark et al. 2026 corrigendum entry added immediately following, with full bibliographic details, URL, opening acknowledgment quoted verbatim, and key corrections summarized. (c) Reagan 1917 entry updated to note that the Reagan/Regan spelling has been corrected in Dark et al. 2026. (d) urbanwildlands.org URL removed from "Alternative mirror sites for Dark et al. 2011" and reclassified in a new note explaining it now hosts the corrigendum; ballonahe.org remains as the sole alternate mirror for the 2011 report.

(9) KEYWORDS UPDATED: "Dark et al. 2026," "corrigendum," "earthquake claim withdrawn," and "heavy rains claim withdrawn" added.)

Version 1.8 (February 2026 — One change from v1.7:

(1) CRANDELL 1994 REFERENCE HARDENED: Single Crandell (1994) reference entry revised to include both the publisher archive URL (primary citation, canonical publisher source) and the Wayback capture index URL (archival redundancy). Both URLs retained under the same single bibliography entry per standard archival hardening practice. Recommended by ChatGPT and Perplexity citation reviews. No substantive changes.)

Version 1.7 (February 2026 — Three changes from v1.6:

(1) REAGAN 1917 PAGE NUMBERS ADDED — APPENDIX A.1: Appendix A.1 Reagan 1917 verified-status entry updated with precise page locations for all key findings: earthquake mentions at pp. 249 and 253 (both 1857 Fort Tejon earthquake, unrelated to 1825); Warner

1825 quotation in early compilation at p. 12; Reagan/Guinn 1825 narrative synthesis at pp. 239–240; key 1825 witnesses Sepulveda (p. 19), Tononi (p. 72), Ramirez (p. 80), Vejar (p. 108).

(2) REAGAN 1917 PAGE NUMBERS ADDED — APPENDIX A.2: Appendix A.2 Reagan 1917 full text review methodology entry updated with same page locations, providing auditable precision documentation for all assertions derived from direct inspection.

(3) LAT 1906 ACCESS ANNOTATION ADDED: Bracketed annotation added after the Dark et al. 2011 bibliography quotation of the "lat 1906" entry, clarifying that this is Dark et al.'s citation (for the heavy rains claim only), that no independent digital access path has been identified as of February 2026, and that access may be available through ProQuest Historical Newspapers or physical archive holdings. This preempts any challenge that this source was not chased to ground; the document already states it has not been independently analyzed.)

Version 1.6 (February 2026 — Five changes from v1.5:

(1) REAGAN 1917 FULL TEXT VERIFIED — FINDING 2 UPGRADED: Complete primary source reviewed (280 pages, 915,033 characters, 275+ named eyewitness interview transcripts plus Reagan's narrative synthesis). The word "earthquake" appears exactly twice in the entire document, both times describing the 1857 Fort Tejon earthquake; no earthquake reference connected to 1825 exists anywhere in the document. The phrase "three consecutive years of heavy rains" does not appear. Reagan's narrative and all eyewitness testimony attribute the 1825 avulsion to hydraulic forces only. Finding 2 citation status upgraded from "cannot be verified in cited source" to "not present in cited source; cited source actively contradicts the claim." Executive Summary Finding 1 label updated from "Unverified earthquake citation" to "Earthquake claim contradicted by cited source." Conclusion paragraph updated accordingly. Appendix A.1 Reagan 1917 entry replaced with verified-status entry. Reference entry updated with full title *Early Floods in Los Angeles County* and verified status notation.

(2) FINDING 2 METHODOLOGICAL NOTE UPDATED: Last sentence added confirming Reagan (1917) does not contain earthquake references and that the document's witnesses consistently describe 1825 in hydraulic terms.

(3) FINDING 5 EXPANDED — 1815–1825 CAUSAL CHAIN: New section added after Key Points describing the mechanistically linked two-event sequence documented in Crandell (1994): a flood approximately a decade before 1825 formed a debris dam at the Elysian Narrows that deflected the river into Ballona Creek drainage; the catastrophic failure of that dam in April 1825 released the wall of water that permanently rerouted the river to San Pedro Bay. This 1815–1825 causal chain is entirely absent from Dark et al. 2011 and CDFW's EIR. Executive Summary Finding 5 updated to reflect this addition.

(4) FINDING 5 EXPANDED — EYEWITNESS SCOPE NOTE: New scope note added clarifying that the seven Reagan (1917) witnesses confirming Ballona as the pre-1825 route are reporting

oral tradition and received knowledge, not first-hand observation of the pre-1825 channel, as no witness could have had personal memory of conditions before approximately 1815.

(5) FINDING 6 FAILURE 1 LABEL UPDATED: "Unverified citation" updated to "Contradicted citation" to reflect the stronger evidentiary finding from full text review. ITU-T framework entry updated from "NOT FOUND" to "NOT PRESENT (full text verified)." Appendix A.2 updated with Reagan 1917 full text review methodology entry.)

Version 1.5 (February 2026 — Three changes from v1.4:

(1) CSUMB MIRROR ADDED FOR LYNCH: Added third access point for Lynch (1931) — CSUMB Digital Commons institutional repository (https://digitalcommons.csumb.edu/hornbeck_usa_3_d/55/), more stable long-term than cepsym.org. Lynch entry now has three access points: Huntington Library (authoritative), CEPASYM mirror, CSUMB Digital Commons mirror.

(2) TOPPOZADA ALTERNATIVE ACCESS URLS RESTORED: Added two alternative access URLs for Toppozada et al. (2002) that were present in predecessor document v1.42 but inadvertently omitted in v1.0 rewrite: USGS Publications Warehouse (<https://pubs.usgs.gov/publication/70024232>) and ResearchGate (<https://www.researchgate.net/publication/253512379>).

(3) DUPLICATE URL CONFIRMED NOT PRESENT: Second apparent instance of Huntington URL confirmed to be correctly placed in version log entry for v1.4, not a document body duplication. No correction required.)

Version 1.4 (February 2026 — One change from v1.3:

(1) LYNCH HYPERLINKS RESTORED: Added two URLs for Lynch (1931) in References — authoritative copy at Huntington Library (<https://www.huntington.org/collections/lib-mssclover-aspacespace-4c573ee6b60cfdfe00cb6ebc90>) and mirror copy at cepsym.org. These URLs were present in predecessor document versions but were inadvertently omitted during the v1.0 rewrite. Also removed the now-superseded "Available: Water Resources Center Archives, University of California, Berkeley" notation, which is replaced by the direct URLs.)

Version 1.3 (February 2026 — One change from v1.2:

(1) HYPERLINK VERIFICATION NOTICE ADDED: Added "All hyperlinks verified live as of February 2026; targets and availability may change without notice." at the top of the References section, per recommendation of ChatGPT and Perplexity hyperlink audits. All 12 URLs confirmed resolving correctly by Perplexity live verification. Filename updated to v1.3.)

Version 1.2 (February 2026 — One change from v1.1:

(1) METADATA MOVED TO FRONT PAGE: Document prepared / Author / Filename block moved from end of document to front page immediately after version number, for immediate identification.)

Version 1.1 (February 2026 — Two changes from v1.0:

(1) FINDING 6 EXPANDED — CDFW INDEPENDENT AUTHORIAL CHOICES: Added dedicated subsection "CDFW EIR: Independent Authorial Choices" with full three-sentence EIR quote and analysis of four specific choices CDFW made that compounded rather than resolved the underlying problems: (a) explicit 1825 anchoring not present in Dark et al.'s causal sentence; (b) removal of all hedging language ("residents mention," "may not be possible to determine"); (c) addition of project justification sentence ("significant impact on the form and function") not present in Dark et al.; (d) inheritance of temporal contradiction made more explicit by 1825 anchoring. Transformation analysis table and professional standards comparison table updated accordingly. Executive Summary Finding 6 and Conclusion updated to reflect expanded scope.

(2) VERSION HISTORY COLLAPSED: Prior version history (v1.8 through v1.42 of predecessor document, and v1.0 of this document) not reproduced here. Full predecessor document history is archived at Internet Archive:
<https://archive.org/details/cdfw-reir-scoping-comments-earthquakes-tom-mc-mahon-2023-11-20-02> — consult that record for the complete development history of the analysis through v1.42 of the predecessor document.)